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(54) **Cutting insert for an abrasive tool and method of mounting**

Schneideinsatz für ein Schleifwerkzeug und Verfahren zur Montage

Élément de coupe rapporté pour un outil abrasif et procédé de montage

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(56) References cited:

EP-A- 0 211 642	DE-A- 3 500 931
FR-A- 2 609 750	GB-A- 2 159 857
US-A- 2 614 813	US-A- 3 749 190
US-A- 4 199 035	US-A- 4 323 131
US-A- 4 381 825	

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Description

BACKGROUND TO THE INVENTION

5 THIS invention relates to abrasive tools.

Abrasive tools are known which comprise a body in which are mounted cutting inserts which have a wear-resistant or abrasive cutting layer. It is this layer that is used to perform a cutting or abrading action. The support for the wear-resistant layer may be in the form of a post, normally of squat proportions. The mounting of the post in the working face of the tool body can present problems to the manufacturer and the user of the abrasive tool. With conventional

10 insert fixing methods, the subsequent replacement of worn inserts can also be a problem.
US-A-4 199 035 discloses the securing of a removable cutter insert to the drill crown of a drill bit. A bushing with a threaded inner wall is fixed in a recess in the drill crown, and a sleeve having a threaded outer wall engages the bushing. The shaft of the cutter insert is tapered and secured in the recess in the drill crown by a corresponding taper on the inner wall of the sleeve.

15 US-A-3 749 190 discloses a method of retaining a button in a rock drill bit, in which the button has a tapered shaft portion which is secured within a recess in the working face of the drill bit by a sleeve which is wedged between the tapered wall of the shaft portion of the button and the wall of the recess so as to deform into an undercut in the wall of the recess.

20 **SUMMARY OF THE INVENTION**

According to a first aspect of the present invention, there is provided a method of mounting a cutting insert in the working face of an abrasive tool body, the method comprising the steps of providing an externally threaded plug formed with a recess therein, screwing the plug into a complementally threaded socket in the working face of the tool body, and securing the cutting insert in the recess in the plug, the cutting insert having a transversely extending formation which locates in an undercut in the recess in the plug with a gap between the formation and the undercut, and securing of the cutting insert in the recess being achieved by means of a locking insert located in the gap between the formation and the undercut.

25 In some cases, the insert is secured to the plug and the plug is thereafter screwed into the socket. In other cases, particularly where there is a preferential orientation for the cutting insert, the plug is first screwed into the socket and the cutting insert is thereafter secured to the plug. In all cases, it is preferred that the locking insert is deformed into the gap.

In one application of the method it is used to mount a studcutter in the working face of a drill bit.

30 According to another aspect of the invention, there is provided an abrasive tool having a working face, a threaded socket in the working face, a complementally threaded plug screwed into the socket, a recess in the plug, a cutting insert and a transversely extending formation on the cutting insert, the cutting insert being located in the recess with the formation in an undercut in the recess in the plug, and the cutting insert being secured in the recess by a locking insert which locates in a gap between the formation and the undercut.

35 In one version, the cutting insert has a post with a conically flared foot and the undercut is conical in shape, the foot locating in the undercut and the cutting insert being secured in the recess by a locking insert, initially of tubular shape, deformed into the gap between the foot and the undercut. The locking insert may have slots formed in one end thereof.

40 In another version, the cutting insert has a post with an enlarged waist and the recess includes an annular undercut, the waist locating in the annular undercut and the cutting insert being secured in the recess by a locking insert, initially of tubular shape, deformed into the gap between the waist and the annular undercut.

45 In yet another version, the cutting insert has a post with a projection extending therefrom in one radial direction and the recess includes an undercut enlargement and a groove extending from a face of the plug to the enlargement, the radial projection being inserted through the groove and locating in the enlargement and the cutting insert being secured in the recess by means of an insert inserted through the groove and deformed into the gap between the projection and the enlargement.

50 The abrasive tool may be a drill bit and the cutting insert may then be a studcutter.

BRIEF DESCRIPTION OF THE DRAWINGS

55 The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates a first embodiment of the invention in a cross-sectional view;

Figures 2a and 2b illustrate a second embodiment in an exploded state and an assembled state respectively;

Figures 3a and 3b illustrate a third embodiment in an exploded state and an assembled state respectively; and

Figures 4a and 4b illustrate a fourth embodiment in an exploded state and an assembled state respectively.

DESCRIPTION OF THE DRAWINGS

Figure 1 shows an abrasive tool 10, in this case a drill bit, having a working face 12 formed with a series of threaded sockets 14, only one of which is visible. Screwed into the socket 14 is a complementally threaded plug 16. The plug 16 has a central recess 18 in which the post 20 of a cutting insert 22, in this case a studcutter, is fixed.

The studcutter 22 has a post 20 to which a diamond compact 24 is secured in a conventional manner. The compact 24 includes a PCD (polycrystalline diamond) layer 26 forming a cutting surface of the studcutter. As illustrated, the post 20 has a round cylindrical portion 20A and a conically flared foot 20B. The maximum diameter of the foot 20B is indicated by the numeral 28.

The recess 18 in the plug 16 is of undercut configuration with a round cylindrical portion 18A having a diameter 30 and a conically tapering portion 18B providing the undercut. The maximum diameter 28 of the foot 20B is less than the diameter 30 so that the post 20 can be located loosely in the recess 18 with a gap between the post and the recess.

The post 20 is secured in the recess 18 by means of a locking insert in the form of a shim or sleeve 32. The shim 32 is of malleable material such as steel and is initially of round tubular form. In order to secure the post 20 in the recess 18, the shim is forced downwardly into the gap between the post and the recess, so that the lower end of the shim flares outwardly, guided by the shape of the gap, to the illustrated configuration. It will be appreciated that with the shim deformed into the gap in this manner, the post 20 cannot be withdrawn from the recess 18 and the studcutter 22 is effectively secured to the plug 16.

The plug 16 may, for instance, be of a sintered carbide material, but is preferably of steel. With the post 20 secured in the recess 18 as described above, the plug can be screwed into the socket 14, thereby fixing the studcutter 22 into the working face 12 of the drill bit 10 as seen in Figure 1.

In the preferred implementation of the embodiment of Figure 1, the plug 16 is initially screwed home tightly into the socket 14 and the studcutter 22 is thereafter secured in place in the recess 18, by means of the deformable shim. In this way, the studcutter can be correctly orientated relative to the direction in which it will perform a cutting action in practice.

In cases where the studcutter 22 is subject to rotational forces in use of the drill bit 10, the hand of the threaded connection between the plug and the socket 14 may be chosen to be self-tightening under such rotational forces.

If the studcutter 22 should wear and require replacement, it is a relatively simple matter to unscrew the plug 16 and replace it with another identical plug into which a fresh studcutter is secured. To facilitate the screwing and unscrewing of the plug 16 relative to the socket 14, suitable spanner-engagable depressions or the like (not illustrated) can be provided in the exposed surface of the plug.

Reference is now made to Figures 2a and 2b which illustrate, in exploded and assembled views respectively, a slightly modified version of the invention. In this case, after the plug 16 has been screwed home in its socket 14, a studcutter 22 is secured in the recess 18 in the plug by means of a shim 32 in the form of a tubular sleeve which has slots 40 extending from its lower edge to facilitate outward flaring of the shim as it is driven downwardly into the gap between the post 20 and the recess 18. It will also be noted in Figure 2 that the studcutter 22 has an arcuately shaped working end 42 of wear resistant material on the post.

In Figures 3a and 3b, the post 20 of the studcutter has a thickened waist portion 44 but is otherwise of cylindrical shape. Once again, there is an arcuately shaped working end on the post. The recess 18 is formed with an undercut shape as illustrated. The post 20 can be slipped into the recess 18 and is secured there, as in the previous embodiments, by means of a deformable shim or sleeve 46 which is driven into the gap between the post and the recess.

In Figures 4a and 4b, the post 20 has an arcuate working end 48 and includes a radial projection 50. The recess 18 in the plug 16 includes a groove or keyway 52 leading from the surface of the plug to an undercut 54. The post can be slipped into the recess with the projection 50 moving along the groove 52 and finally locating in the undercut 54. The post is secured in position in the plug by means of a deformable strip 56, typically of malleable metal, which is forced down the groove 52 and into the gap between the projection 50 and the undercut 54, as illustrated.

It will be appreciated that the location of the projection 50 in the undercut 54 in Figure 4b prevents the post 20 from rotating with respect to the plug 16. This type of secural system may thus be used in situations where there has to be high torsional resistance to rotation of the studcutter or other cutting insert with respect to its mounting. It will be appreciated that various other non-rotation measures can be taken and that a system such as that illustrated in Figure 4 could be used with the other embodiments.

As stated above, it is preferable with an embodiment such as that of Figure 1 to screw the plug home into the

socket before the studcutter is secured to the plug. In the case of the studcutter 22 of Figure 1, this is because the studcutter has a preferential cutting or working direction and it is accordingly important for the studcutter to be properly orientated when the abrasive tool is assembled. In the case of studcutters such as those seen in the other Figures, there is no preferred working direction, so in these cases it is possible to secure the studcutter to the plug first and only then screw the plug into its socket.

It should also be noted that the invention is not limited to the mounting of studcutters whether having one of the illustrated shapes or otherwise. In the case of studcutters, various other cross-sectional post and working end shapes are possible. Apart from studcutters, it is anticipated that the invention will find application in the mounting of a wide variety of different cutting inserts in abrasive tools.

Claims

1. A method of mounting a cutting insert (22) in the working face (12) of an abrasive tool body, the method comprising the steps of providing an externally threaded plug (16) formed with a recess (18) therein, screwing the plug (16) into a complementally threaded socket (14) in the working face (12) of the tool body, and securing the cutting insert (22) in the recess (18) in the plug (16), the cutting insert (22) having a transversely extending formation (20B, 44, 50), characterised in that the formation (20B, 44, 50) is located in an undercut (18B, 54) in the recess (18) in the plug (16) with a gap between the formation (20B, 44, 50) and the undercut (18B, 54), and securing of the cutting insert (22) in the recess (18) is achieved by means of a locking insert (32, 46, 56) located in the gap between the formation (20B, 44, 50) and the undercut (18B, 54).
2. A method according to claim 1 characterised in that the insert (22) is secured to the plug (16) and the plug (16) is thereafter screwed into the socket (14).
3. A method according to claim 1 characterised in that the plug (16) is screwed into the socket (14) and the cutting insert (22) is thereafter secured to the plug 16.
4. A method according to any one of the preceding claims when used to mount a studcutter (22) in the working face (12) of a drill bit.
5. method according to any one of the preceding claims including the step of deforming the locking insert (32, 46, 56) into the gap.
6. An abrasive tool having a working face (12), a threaded socket (14) in the working face (12), a complementally threaded plug (16) screwed into the socket (14), a recess (18) in the plug (16), a cutting insert (22) and a transversely extending formation (20B, 44, 50) on the cutting insert (22), characterised in that the cutting insert (22) is located in the recess (18) with the formation (20B, 44, 50) in an undercut (18B, 54) in the recess (18) in the plug (16), and the cutting insert (22) is secured in the recess (18) by a locking insert (32, 46, 56) which locates in a gap between the formation (20B, 44, 50) and the undercut (18B, 54).
7. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post (20) with a conically flared foot (20B) and the undercut (18B) is conical in shape, the foot (20B) locating in the undercut (18B) and the cutting insert (22) being secured in the recess (18) by a locking insert (32), initially of tubular shape, deformed into the gap between the foot (20B) and the undercut (18B).
8. An abrasive tool according to claim 7 characterised in that the locking insert (32) has slots (40) formed in one end thereof.
9. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post (20) with an enlarged waist (44) and the recess includes an annular undercut, the waist (44) locating in the annular undercut and the cutting insert (22) being secured in the recess (18) by a locking insert (46), initially of tubular shape, deformed into the gap between the waist (44) and the annular undercut.
10. An abrasive tool according to claim 6 characterised in that the cutting insert (22) has a post with a projection (50) extending therefrom in one radial direction and the recess (18) includes an undercut enlargement (54) and a groove (52) extending from a face of the plug to the enlargement (54), the radial projection (50) being inserted through the groove (52) and locating in the enlargement (54) and the cutting insert (22) being secured in the recess (18)

by means of an insert (56) inserted through the groove (52) and deformed into the gap between the projection (50) and the enlargement (54).

11. An abrasive tool according to any one of claims 6 to 10 characterised in that it is a drill bit.

12. An abrasive tool according to claim 11 characterised in that the cutting insert (22) is a studcutter.

Patentansprüche

1. Verfahren zum Montieren eines Schneideinsatzes in der Arbeitsfläche (12) eines Abrasiv-Werkzeugkörpers, mit den Schritten:
Bereitstellen eines mit einem Außengewinde versehenen Schraubstopfens (16), der mit einer Aussparung (18) ausgebildet ist, Einschrauben des Schraubstopfens (16) in eine mit einem Gegengewinde versehene Fassung (14) in der Arbeitsfläche (12) des Werkzeugkörpers, und Sichern des Schneideinsatzes (22) in der Aussparung (18) in dem Schraubstopfen (16), wobei der Schneideinsatz (22) eine sich transversal erstreckende Ausformung (20B,44,50) aufweist, dadurch gekennzeichnet, daß die Ausformung (20B,44,50) in einer Hinterschneidung (18B,54) in der Aussparung (18) in dem Schraubstopfen (16) mit einem Spalt zwischen der Ausformung (20B,44,50) und der Hinterschneidung (18B,54) angeordnet wird, und daß die Sicherung des Schneideinsatzes (22) in der Aussparung (18) durch ein Verschlußstück (32,46,56) erfolgt, das in dem Spalt zwischen der Ausformung (20B,44,50) und der Hinterschneidung (18B,54) angeordnet ist.
2. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, daß der Einsatz (22) an dem Stopfen (16) gesichert wird, und der Stopfen (16) danach in die Fassung (14) eingeschraubt wird.
3. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, daß der Stopfen (16) in die Fassung (14) eingeschraubt wird, und danach der Schneideinsatz (22) an dem Stopfen (16) befestigt wird.
4. Verfahren gemäß einem der vorhergehenden Ansprüche, angewendet, um einen "Stummelmeißel" (22) in der Arbeitsfläche (12) eines Bohrmeißels zu montieren.
5. Verfahren gemäß einem der vorhergehenden Ansprüche, mit dem Schritt des Eindeformierens des Verschlußstückes (32,46,56) in den Spalt.
6. Abrasivwerkzeug mit einer Arbeitsfläche (12), einer mit einem Gewinde versehenen Fassung (14) in der Arbeitsfläche (12), einem mit einem Gegengewinde versehenen Schraubstopfen (16), der in den Sockel (14) eingeschraubt ist, einer Aussparung (18) in dem Stopfen (16), einem Schneideinsatz (22) und einer sich transversal erstreckenden Ausformung (20B,44,50) an dem Schneideinsatz (22), dadurch gekennzeichnet, daß der Schneideinsatz (22) in der Aussparung (18) mit der Ausformung (20B,44,50) in einer Hinterschneidung (18B,54) in der Aussparung (18) in dem Stopfen (16) angeordnet ist, und der Schneideinsatz (22) in der Aussparung (18) durch ein Verschlußstück (32,46,56) befestigt ist, welches in einem Spalt zwischen der Ausformung (20B,44,50) und der Hinterschneidung (18B,54) angeordnet ist.
7. Abrasivwerkzeug gemäß Anspruch 6, dadurch gekennzeichnet, daß der Schneideinsatz (22) einen Bolzen (20) mit einem konisch erweiterten Fuß (20B) aufweist, und die Hinterschneidung (18B) von konischer Form ist, wobei der Fuß (20B) in der Hinterschneidung (18B) angeordnet ist, und der Schneideinsatz (22) in der Aussparung (18) durch ein Verschlußstück (32) gesichert ist, das ursprünglich rohrförmig ist, welches in den Spalt zwischen dem Fuß (20B) und der Hinterschneidung (18B) eindeformiert ist.
8. Abrasivwerkzeug gemäß Anspruch 7, dadurch gekennzeichnet, daß das Verschlußstück (32) Schlitze (40) aufweist, die an einem Ende desselben ausgebildet sind.
9. Abrasivwerkzeug gemäß Anspruch 6, dadurch gekennzeichnet, daß der Schneideinsatz (22) einen Bolzen (20) mit vergrößertem Mittelteil (44) aufweist, und die Aussparung eine ringförmige Hinterschneidung aufweist, wobei das Mittelteil (44) in der ringförmigen Hinterschneidung angeordnet ist, und der Schneideinsatz (22) in der Aussparung (18) durch ein Verschlußstück (46) gesichert ist, das ursprünglich rohrförmig ist, welches in den Spalt zwischen dem Mittelteil (44) und der ringförmigen Hinterschneidung eindeformiert wird.

10. Abrasivwerkzeug gemäß Anspruch 6, dadurch gekennzeichnet, daß der Schneideinsatz (22) einen Bolzen mit einer Auskrägung (50) aufweist, die radial davon absteht, und die Aussparung (18) eine hinterschnittene Erweiterung (54) und eine Nut (52) aufweist, die sich von einer Fläche des Stopfens zu der Erweiterung (54) erstreckt, wobei die radiale Auskrägung (50) durch die Nut (52) eingeführt und in der Erweiterung (54) angeordnet ist, und der Schneideinsatz (22) in der Aussparung (18) mittels eines Einsatzstücks (56) gesichert ist, das durch die Nut (52) eingeführt und in den Spalt zwischen der Auskrägung (50) und der Erweiterung (54) eindeformiert wird.
11. Abrasivwerkzeug gemäß einem der Ansprüche 6 bis 10, dadurch gekennzeichnet, daß es ein Bohrmeißel ist.
12. Abrasivwerkzeug gemäß Anspruch 11, dadurch gekennzeichnet, daß der Schneideinsatz (22) ein "Stummelmeißel" ist.

Revendications

1. Procédé pour le montage d'un élément de coupe (22) dans la face de travail (12) d'un corps d'outil abrasif, le procédé comprenant les étapes consistant à mettre en oeuvre une cheville filetée extérieurement (16) dans laquelle est ménagée un évidement (18), à visser la cheville (16) dans une douille filetée de façon complémentaire (14) dans la face de travail (12) du corps d'outil, et à fixer l'élément de coupe (22) dans l'évidement (18) de la cheville (16), l'élément de coupe (22) ayant une formation s'étendant transversalement (20B, 44, 50), caractérisé en ce que la formation (20B, 44, 50) est située dans une contre-dépouille (18B, 54) de l'évidement (18) dans la cheville (16) avec un espace vide entre la formation (20B, 44, 50) et la contre-dépouille (18B, 54), et la fixation de l'élément de coupe (22) dans l'évidement (18) étant réalisée au moyen d'un insert de blocage (32, 46, 56) situé dans l'espace vide entre la formation (20B, 44, 50) et la contre-dépouille (18B, 54).
2. Procédé selon la revendication 1, caractérisé en ce que l'élément de coupe (22) est fixé sur la cheville (16) et la cheville (16) est ensuite vissée dans la douille (14).
3. Procédé selon la revendication 1, caractérisé en ce que la cheville (16) est vissée dans la douille (14) et l'élément de coupe (22) est ensuite fixé sur la cheville (16).
4. Procédé selon l'une quelconque des revendications précédentes, utilisé pour le montage d'un élément de coupe (22) dans la face de travail d'un foret de perçage ou couronne de fleuret.
5. Procédé selon l'une quelconque des revendications précédentes, comprenant l'étape consistant à déformer l'insert de blocage (32, 46, 56) dans l'espace vide.
6. Outil abrasif comportant une face de travail (12), une douille filetée (14) dans la face de travail (12), une cheville filetée complémentaire (16) vissée dans la douille (14), un évidement (18) dans la cheville (16), un élément de coupe (22) et une formation s'étendant transversalement (20B, 44, 50) sur l'élément de coupe (22), caractérisé en ce que l'élément de coupe (22) est situé dans l'évidement (18) avec la formation (20B, 44, 50) dans une contre-dépouille (18B, 54) dans l'évidement (18) de la cheville (16), et l'élément de coupe (22) est fixé dans l'évidement (18) par un insert de blocage (32, 46, 56) qui est situé dans un espace vide entre la formation (20B, 44, 50) et la contre-dépouille (18B, 54).
7. Outil abrasif selon la revendication 6, caractérisé en ce que l'élément de coupe (22) comporte un axe (20) avec un pied évasé coniquement (20B) et la contre-dépouille (18B) est de forme conique, le pied (20B) étant positionné dans la contre-dépouille (18B) et l'élément de coupe (22) étant fixé dans l'évidement (18) au moyen d'un insert de blocage (32), initialement de forme tubulaire, déformé dans l'espace vide entre le pied (20B) et la contre-dépouille (18B).
8. Outil abrasif selon la revendication 7, caractérisé en ce que l'élément de blocage (32) présente des fentes (40) formées dans l'une de ses extrémités.
9. Outil abrasif selon la revendication 6, caractérisé en ce que l'élément de coupe (22) comporte un axe avec une partie centrale agrandie (44) et l'évidement comprend une contre-dépouille annulaire, la partie centrale (44) se situant dans la contre-dépouille annulaire et l'élément de coupe (22) étant fixé dans l'évidement (18) par un insert de blocage (46), initialement de forme tubulaire, déformé dans l'espace vide entre l'élément central (44) et la

contre-dépouille annulaire.

5 10. Outil abrasif selon la revendication 6, caractérisé en ce que l'élément de coupe (22) présente un axe avec une saillie (50) s'étendant à partir de celui-ci dans une direction radiale et l'évidement (18) comprend un agrandissement de contre-dépouille (54) et une gorge (52) s'étendant à partir d'une face de la cheville vers l'agrandissement (54), la saillie radiale (50) étant introduite dans la gorge (52) et situant dans l'agrandissement (54) et l'élément de coupe (22) étant fixé dans l'évidement (18) au moyen d'un insert (56) introduit par la gorge (52) et déformé dans l'espace vide entre la saillie (50) et l'agrandissement (54).

10 11. Outil abrasif selon l'une quelconque des revendications 6 à 10, caractérisé en ce qu'il s'agit d'un foret de perçage ou couronne de fleuret.

12. Outil abrasif selon la revendication 11, caractérisé en ce que l'élément de coupe (22) est un élément de coupe de goujons.

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Fig 2a

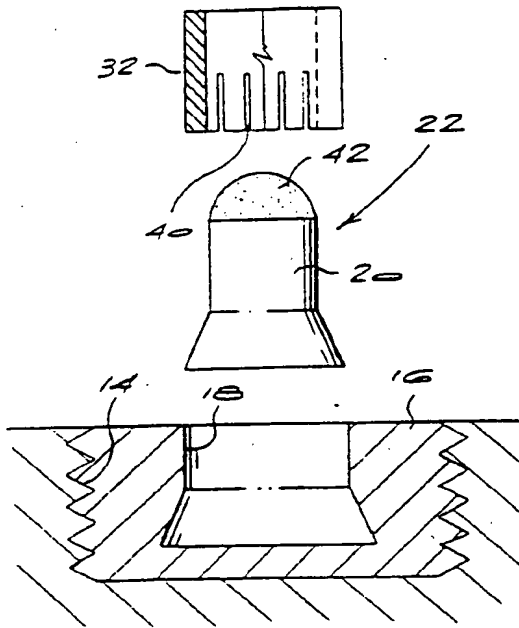


Fig 2b

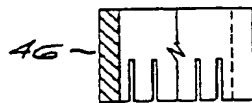
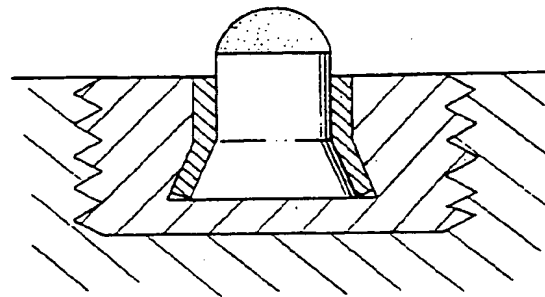


Fig 3a

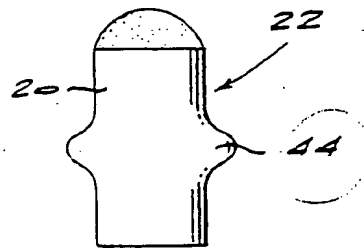


Fig 3b

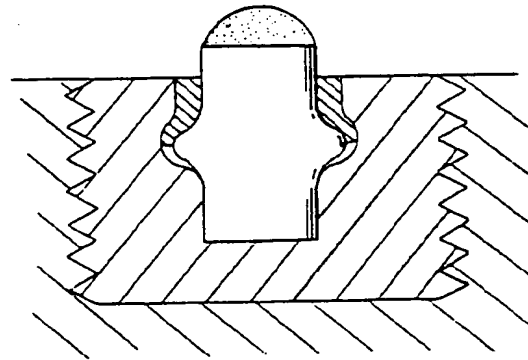
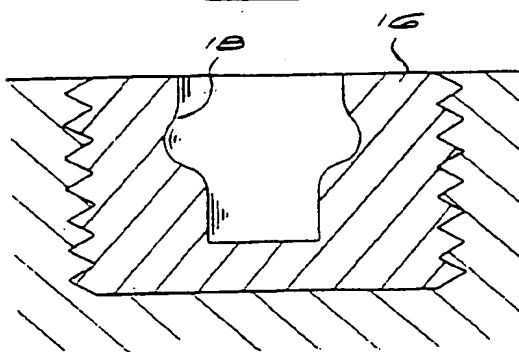


Fig 4a

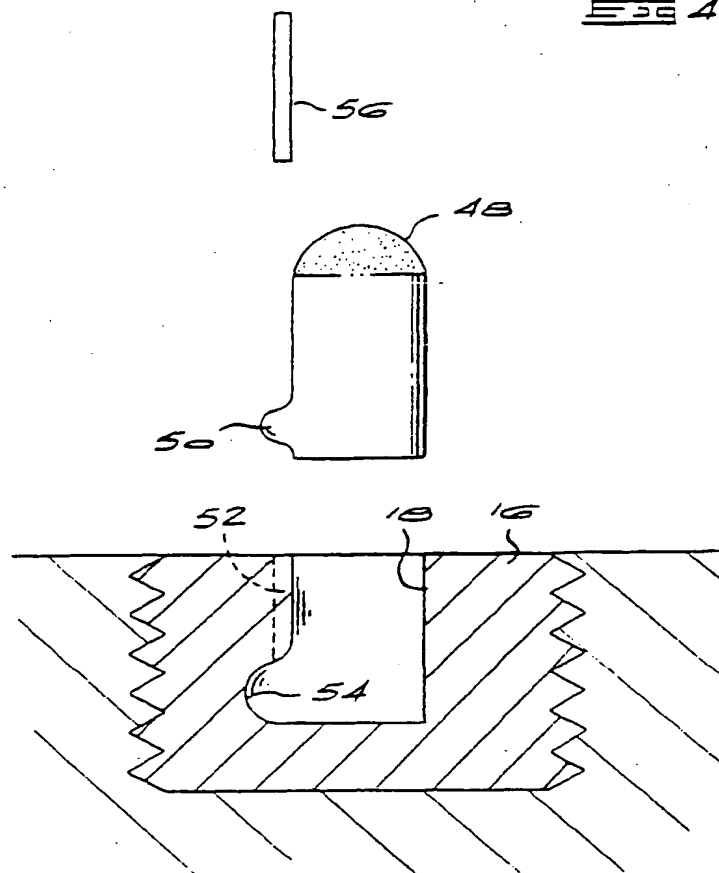


Fig 4b

